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JPRS-ESA-85-038

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EAST EUROPE REPORT

SCIENCE AND TECHNOLOGY

CONTENTS

HUNGARY, USSR AGREE TO TRADE COMPUTER PROGRAM

Budapest MAGYAR HIRLAP in Hungarian 16 Nov 85 p 5

[Text] A Hungarian-Soviet 2000,000-ruble agreement for reciprocal sale of computer programs was in Budapest on 15 November. Hungarian participants in the deal were SZAMALK (Szamitastechnika Alkalmazasi Vallalat, Computer Technology Applications Institute) and representatives of Metrimpex foreign trade enterprise. The Soviet signatories represented the ELORG Foreign Trade Enterprise.

SZAMALK sold a program package developed by the Computer Technology Enterprise of the Csepel Works for 126,000 rubles. The program interprets software prepared for ICL computers making it accessible to ES computers. In return the Soviets will ship a data base managing program and a PL-1 translator program.

SZAMALK considers the deal significant because software is increasingly becoming a commodity in trade between socialist countries. SZAMALK exports of intellectual products consisting mainly of sales of software amounted to 30 million forints last year and are expected to increase to 40-50 million forints this year. However, this is the first time software has been sold independently to a socialist country. Specialists estimate that ruble-accounted percentage of foreign trade in programs amounts to only 1-2 percent. The percentage could increase to 30-40 percent in 2 or 3 years.

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CSO: 2502/16

COMPUTER NETWORK EXPANSION DESCRIBED

East Berlin NEUE ZEIT in German 1 Oct 85 p 5

[Article by Prof Dr Hermann Walter Meier, department head in the Institute for Information Sciences and Computer Technology of the GDR Academy of Sciences: "Purposeful Searching for Data--Computers Free Up Time for Creative Thinking"]

[Excerpts] Modern computer technology, based on business computers and communications technology, is bringing about a substantial increase in productivity throughout the economy. In the field of engineering, for example, routine work could be automated, securing time and energy for creative processes. The use of modern computer technology together with corresponding information and communications technologies is also an important task for the management of materials, for organizing cooperative relationships, and for savings and loan associations, banks, insurance companies, and trade in general.

Computer-supported information and communications technologies are a combination of traditional computer and data-processing technologies. They combine the advantages of traditional technologies: fast transfer of information and the capacity for timed interrupts of communications through computer-supported storage. At the same time, this data transfer requires few raw materials and is characterized by low energy needs. Such modern technologies are well suited for information transfer--for example, by means of remote transcribers or copiers for business use--, the reading of large blocks of information into data banks, and searches for specific, selected data.

Test Operation of Remote Transfer Systems

So-called data networks have been taking their place alongside telephone networks on an international level in recent years. At the beginning of this year, for example, testing was begun on remote data transfer between the GDR Central Institute for Information and Documentation in Berlin and the International Center for Scientific and Technical Information in Moscow. This system can be used to transmit scientific and technical information in a matter of seconds. This is an important step toward further intensifying the exchange of information, but in addition, engineers, scientists and administrators, for example, can use the system conversationally to fetch information on the data network through modern display screen technology.

As a result of the use of microelectronics in our republic, computer technology, in the form of business computers, is beginning to dominate the workplace in certain areas of the economy. The effectiveness of this technology increases as it becomes possible to link the individual units by powerful remote transmission lines, establishing a computer network. This arrangement enables every user of a data network to make immediate and direct use of the interconnected computers for his own tasks at the workplace at low cost.

DELTA Optimized Streamlined

There have been some pilot systems using this method, e.g. for the VEB Data Processing combine, for optimization of shipping procedures, streamlining of monetary processes, and advance ticket sales. DELTA Dezentraler Lastverbund von Terminals und Arbeitsrechnern; Decentralized Load Network of Terminals and Work Computers, a computer network of the GDR Academy of Sciences and the University System for Research and Teaching, has been operating since 1981 as the first complex system of this type in any socialist country. Scientists are using it to test new communications technologies. Computer centers in Berlin, Dresden, and Potsdam, and those of the Wilhelm Pieck collective of the VEB Mansfeld and the CSSR Academy of Sciences in Prague are connected to it at present. Many institutions use the DELTA computer network to gain access to central resources, for example, or special services offered by the computer centers connected to the systems.

The economic advantages of the DELTA computer network are not limited to research purposes alone. One example of another application is the guidelines for irrigation of agricultural areas. The model was developed by scientists at the GDR Academy of Agriculture. More than 300 farms input data into the computer network by telephone or telex on the conduct of existing irrigation plans, on plant growth, and on soil parameters. Model calculations taking weather forecasts into account can then be used promptly to establish recommendations on the irrigation of fields. So far about 80 percent of all the irrigation systems in the GDR have been tied into the DELTA network.

Aid in Precise Synchronization

The use of computer-supported information and communications technologies also has its advantages in industry. Relationship arising from specialization and cooperation between and within collectives require very precise synchronization, for example. Here data banks can be used to quickly determine the current status of production during virtually any phase at any time and to derive administrative decisions from this information. This also has a favorable effect on production continuity.

The GDR Academy of Sciences, especially the Data Processing and Computer Technology Institute, is investigating data processing principles and their application and the principles of communications technologies. With scientists at Dresden Technical University, specialists at the VEB Robotron, combine the Data Processing Combine, the German postal service and the Federal Bank of the GDR, they are working to develop and establish a republic-wide data network.

13114/12951
CSO: 2302/2

FORMATION OF SURFACE FIGURE DURING OPTICAL SURFACE POLISHING

East Berlin FEINGERAETETECHNIK in German Vol 34, No 7, 1985 pp 313-316

[Article by Dr A. Leitel, engineer, Technology Division, Friedrich-Schiller University, Jena]

[Text] During manufacture of optical precision components special importance attaches to the polishing operation because being the final surfacing process during manufacture it has a decisive effect upon the precision of optical surfaces. The essential parameters characterizing precision are surface form and the fine surface figure which emerges from a continuous smoothing process.

The following remarks regarding formation of the fine surface figure during polishing relate to the most important optical medium, namely glass. Analogies to other materials may be discovered if one takes into account the elementary structure of such materials.

1. The Connection Between the Process of Material Removal and the Shaping Process

The form of an optical surface is primarily established by the manufacturing processes of polishing and lapping. After these processes there yet remain form deviations $N \approx 1$ µm and surface roughnesses $R_a \approx 0.3$ µm. During polishing these are reduced to a tenth (N) or to a hundredth (R_a) of their initial values. The associated elementary processes are very complex and in the literature are described in various ways which at times are even contradictory. The basic problem presented by the conceptual models of these processes which have emerged historically (microabrasive theory, mechanochemical theory, rheological theory, combined theory) and which are also called polishing theories can be clarified by posing two questions:

i. Do flow processes in the sense of a tangential transport of material at the surface have a share in the polishing process?

ii. In what way is material removed from the surface of the workpiece?

Investigations of the manufacturing process involved in the formation of the fine surface figure in polishing have been conducted. In comparative evaluations of the material-removing process and the smoothing process these investigations have found no significant participation of flow processes in the

leveling of surface relief roughnesses left by the first manufacturing processes [1]. Rather, the smoothing comes about--considered macroscopically--through a laminar removal of the destroyed layer next to the surface, so that high speeds of material removal give rise to correspondingly high smoothing speeds. But the precision of the obtainable fine figure is inversely proportional to the speed of material removal which is determined by

i. the composition of the glass,

ii. the relative velocity,

iii. the applied shearing force and

iv. the conditions of abrasion (polishing agent suspension, polishing agent vehicle).

Investigation methodology and results in this connection are described in [2]. The nonuniform distribution of material removal speed over the surface results in a shape change whose basic causes must thus also be explained in terms of the material-removal process [3].

2. Character of the Fine Surface Figure

The fine figure of a surface is determined by the existing correlated roughness, interrupted by individual isolated surface defects.

The specifications of TGL RGW 638 require that in measuring roughness one should eliminate the effect of surface defects. On the other hand in optical workshops it is the surface defects themselves, i.e., their nature, number, size and situation, which are evaluated in accordance with TGL 33789. According to TGL 31088, for the rough grading of surface fine figure by means of surface symbols (polishing diamonds) there exists no correlation with ranges of roughness depth for optically active surfaces. One must look for the cause of this unsatisfactory situation in the extraordinarily low roughness of polished surfaces. The measurement of this roughness continues today to present difficulties even under laboratory conditions. Measurements published in the literature which have been made using specially developed interferometer methods, scattered light methods and scanning cross section methods [4-7] permit us to draw the following conclusions with respect to the character of the fine surface figure of finished polished glass surfaces:

i. Roughness is a stationary isotropic process having an approximately gaussian distribution of elevation about a mean line with the mean square roughness amounting to $R_q \approx 1$ to 4 nm. The smaller values are obtained by using mechanically stronger glasses and special polishing techniques.

ii. The lateral character of the surface must be described in terms of two different component correlation ranges τ, with $\tau_1 \approx 1$ µm and $\tau_2 \approx 20$ to 30 µm. In addition it is possible for periodic structures to occur having wavelengths of about 1 mm.

iii. The slope of the roughness profile also follows approximately a gaussian distribution and its mean square is less than 1°.

iv. Scratches on soft glasses or unsuitable choices of parameters during polishing change the surface statistics which are then no longer adequately describable by a gaussian distribution.

From the point of view of the engineering aspect of the manufacturing process there are four aspects of the matter permitting conclusions to be drawn with regard to the elementary process of material removal:

i. The isotropy of the roughness may be seen in the absence of oriented processing traces which are so typical of milling procedures.

ii. The very low roughnesses having maximum roughness depths of $R_m \approx 10$ nm amount to only about 1/100th of the polishing grain size.

iii. The existence of two ranges of correlation or of two autocorrelation functions indicates the existence of two different features of the surface attack applied by the polishing tool. The short-range roughness component, together with its correlation range, is of the order of magnitude of the diameter of the polishing grain and is probably determined by the latter. The long-range component may be a consequence of the mesa [flat-topped mountain, tr.] structure of pitch polishing agent vehicles which exhibit lateral relief features of this order of magnitude (in [6] the occurrence of "material flow" is conjectured).

iv. The waviness which may at times be seen with the naked eye as an "orange peel" effect occurs especially during use of synthetic polishing agent vehicles as a consequence of periodic elastic deformations of the tool.

3. Comparison of Material-Removal Processes in the Lapping and Polishing of Glass Materials

The processes of lapping and polishing are characterized by only quantitative differences in grain size, grain hardness and tool elasticity while the geometric and kinematic relationships remain the same. When very fine grain Al_2O_3 powder is used the only remaining significant differences are those relating to the mechanical features of the tools.

A comparative study of lapping and polishing therefore makes sense because on the one hand as a consequence of their "process similarity" it has always been assumed that their elementary component processes would be similar and on the other hand we possess adequate knowledge of the material-removal mechanisms existing in lapping since this process is more accessible to measurement.

During lapping the lapping grains produce stresses in glass material which exceed the strength of the material and yield as a consequence cracks, shell-shaped projections and residual stresses. With the gradual reduction of grain size paralleling corresponding changes in commercially available grain fractions there is also a reduction of roughness and lapping stresses. Experiments

with special lapping agents having grain diameters of about 2 μm indicate minimal arithmetic mean roughness values of ≈100 nm, representing the obtainable lower limit and which are accompanied by an increase in lapping stresses [8]. Therefore with polishing a new quality must be introduced in the process of forming the fine optical figure, a quality which is capable of reducing the roughness of the most finely lapped surfaces by almost two decimal places (Figure 1). The smoothing process as a consequence of the layer by layer removal of material from the layer closest to the destroyed surface is in agreement with the results reported in [8], which indicated a complete elimination of lapping stresses as the polishing process progressed. Evidently the polishing grain produces either no demonstrable stresses or at least none that thus far have been detectable by optical stress analysis. Altogether the qualitative difference between lapping and polishing is a consequence of the superposition of several quantitative changes. A reduction of grain size and grain hardness on the one hand and especially the elastic properties of the polishing agent vehicle on the other hand drastically reduce the effective grain size and the force per grain. Thus, only a very thin surface layer of the workpiece is engaged and in addition this differs through lower hardness and elastic-plastic behavior from the underlying glass. The continuous existence of this polishing layer or BEILBY layer is guaranteed by reason of its physicochemical properties and the low speed of the process of material removal.

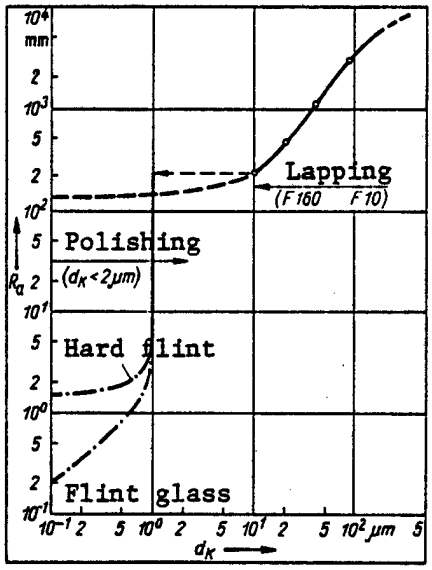

Fig. 1. Fine figure production of optical functional surfaces by lapping and polishing as a function of the working grain size (R_a in μm).

4. On the Possibility of Transferring Tribological Concepts to the Polishing Process

During polishing the tool and the workpiece while subject to pressure perform a sliding relative motion initiated in part necessarily by the main and secondary spindles of the lever mechanism, but which also comes about as a free rotation of the workpiece as a function of the existing friction conditions

(size and distribution of the coefficient of friction). The energy of motion applied by the machine is converted at the site of cleavage into frictional work with one part of this work producing the removal of material from the workpiece and another part producing tool wear.

The polishing may be described as a sliding friction between two solid bodies if one thinks of the working surface of the tool (polishing agent vehicle with suspended polishing grain) as a frictional partner of the glass surface. The polishing agent suspension located at the site of cleavage not only supplies fresh polishing agent but also functions as a cooling agent, flushing agent and lubricating agent in addition to being a medium which is active on the boundary surface. The friction partners are separated by the suspension film; but the texture of the polishing agent vehicle allows the tearing and partial penetration of this film so that there thus exist "mild invasive conditions" in terms of precision optical accuracy specifications. So-called dry polishing without suspension fluid gives rise in consequence of high friction coefficients to rapid removal of material. But the mechanical and thermal stresses of the glass surface can be so high as to produce inaccuracies of shape and surface defects which are recognizable usually only after later production stages (cleaning, ultrasonic washing).

In a manner similar to the theories of polishing there have also been various theories created in tribology whose basic ideas are treated separately today as relating to various stages of wear (16 of these are distinguished in [9]). Since the shaping produced by polishing is determined by processes of material removal [1] perhaps the microscopic mechanisms of wear should be looked upon as the elementary processes constituting polishing and perhaps the molecular-mechanical adhesion-deformation theory of Kragelski [11] should be adopted as a theoretical interpretation. According to this theory a possible but not the decisive phenomenon during polishing would be stage 1 plastic deformation with modification of the microfigure of the frictional body without material removal and without form-changing wear, in conjunction with stage 1 wear [9]. In [11] the region of friction wear processes is separated from the process of surface milling and only those basic wear mechanisms are taken into account for which the critical number of alternating loads, n_{kr}, leading to particle removal is greater than 1. That is the case for elastic and plastic deformation (when considered as an impairment of friction bonds), but not for abrasion (microcutting) and adhesion (microadhesive tearing out of material from more deeply situated surface regions (Figure 2)) as consequences of a so-called internal friction with $n_{kr} = 1$. All four basic mechanisms can occur during friction between two solid bodies and can lead to wear, i.e., separation of material particles. Utilization of this wear from the point of view of manufacturing process engineering should be called "triboseparation" since "wear" is defined as an undesirable degradation process.

5. The Fine Figure of Polished Glass Surfaces Considered as a Product of Triboseparation Processes

Our understanding of the fine figure of a completely polished glass surface is rather stratified. It ranges from the roughness characteristics described in Section 2 through microphotographic illustrations showing both very smooth

areas and scratches and also includes physicochemical surface characteristics (microporosity, microplasticity, concentrations, leached-out areas). Adopting the tribological outlook an attempt is made to interpret from a common point of view phenomena which have formerly seemed contradictory. According to this latter interpretation, the isolated surface defects occurring in polishing (scratches, hairlines, fissures) are understood to be the result of a single impairment of friction bonds, i.e., microcuts and microadhesion resulting from an inappropriate choice of parameters or from impurities in the material. By optimal conduct of the process one can avoid surface defects since the isolated occurrence of conditions yielding internal friction is an atypical and unintentional concomitant phenomenon. This statement can also be made with respect to lapping, where the aim is to achieve a surface free of scratches and holes and having uniform roughness. The actual creation of the fine optical figure in polishing is accomplished through external friction and the mechanical properties of the stratum close to the surface guarantee for this purpose the requisite positive shear strength gradients from the surface into the interior of the workpiece. Here we see the importance of the physicochemical effect of the suspension. The "softening" of the glass surface does not primarily serve to facilitate grain attack but protects the brittle underglass from microabrasion. This combined action of mechanical and chemical factors is also referred to in [12] as an element determining the quality of the polished surface. Therefore it is difficult to understand the questioning of the existence of internal and even external friction which one finds in [13] because on the one hand there is no third form of friction (the gradient of the shear strength would have to be precisely zero for all glasses and polishing conditions) and on the other hand both the conditions (positive gradient of the shear strength) and also the characteristics of an external friction are present: discrete contact between the friction partners and material transport perpendicular to the direction of relative velocity. The latter is confirmed by numerous electron microscopic photographs of polished surfaces which show, especially at places where polishing traces cross, the plastic displacement of material perpendicularly to the direction of the furrows, Figure 3 [photo not reproduced] [14]. The "polishing furrow" in the form of tear-free and fragment-free "scratches" arises only in the presence of the small surface-attack conditions which are characteristic of polishing--that is, when the indenting particles (polishing grain) and/or the load (force per grain) is sufficiently small.

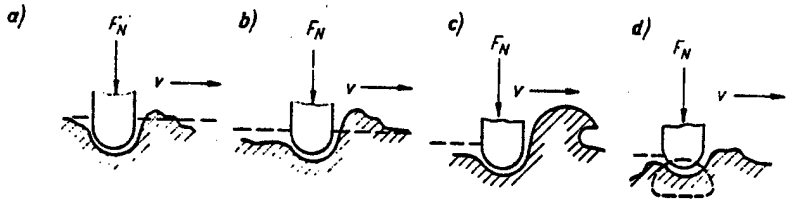

Fig. 2. Physical basic mechanisms of wear [10]: a) elastic deformation; b) plastic deformation; c) abrasion; d) adhesion with tearing out of material from deeply situated regions.

Fig. 3. Crossing of polishing furrows [15]. [Photo not reproduced]

6. Estimating Tribological Parameters

When polishing is treated as a triboseparation process the formation of the optical fine figure as an extremely smooth surface and the production of surface defects may be dealt with from a uniform point of view. But in [13] it is maintained that in the presence of an external friction there is no removal of material and thus no polishing. This reference also adduces as conditions for a positive gradient of shear strength the employment of lubricants as suspension vehicles or the thermal softening of surface layers subject to the effect of large sliding velocities. Thus, the question arises as to whether the theory of triboseparation is capable of describing only the phase of finished polishing under specific conditions or can describe the overall formation of the fine optical figure as a result of material removal. An answer to this could be obtained by estimating some tribological parameters.

A qualitative comparison of different friction mechanisms is possible if one makes use of the dimensionless linear wear intensity I_h (abrasion as a function of slide-path) [9].

The precision optical polishing conditions selected in [1] yield an intensity of the separation process amounting to $I_h \approx 1.25 \cdot 10^{-8}$, which is typical of elastic-plastic deformations as a mode of impairing frictional bonds. This view is also favored by the comparison in Figures 4 and 5 of the time history of material separation during polishing, with its characteristic profile of typical abrasion-time curves.

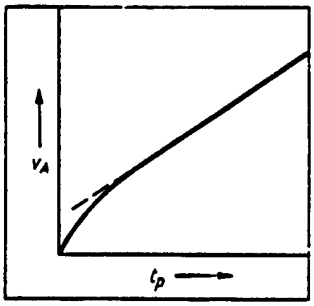

Fig. 4. Removed volume of glass as a function of polishing time.

Further tribological parameters such as the material-attack ratio h/R (penetration depth h, mean spherical radius R of the individual irregularities), specific wear $i_h = I_h A/A_r$ with the ratio of nominal-to-actual contact area and the number of critical loading alterations n_{kr}, which leads to the separation of material particles, could be estimated only with the aid of certain assumptions regarding the complicated friction system. Values were obtained of $h/R \approx 2 \cdot 10^{-2}$ and $i_h \approx 3 \cdot 10^{-6}$ [1], which according to Figure 6 likewise indicate an external friction with elastic-plastic deformations.

For the test conditions selected and assuming wear particles to have a linear dimension of 1 nm the number of critical load alternations was reckoned at 2,000, which were obtained, for a friction path of 80 mm, in 0.4 sec.

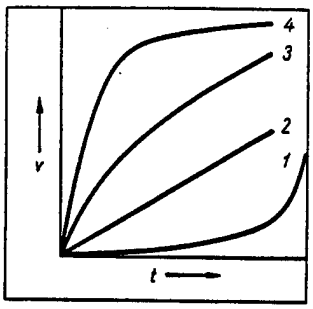

Fig. 5. Characteristic profile of the total abrasion versus time curve for different destructive mechanisms or different destructive conditions according to [10]: 1--fatigue destruction; 2--abrasive destruction mechanism; 3--plastic-elastic deformation; 4--wear by friction bodies with so-called starting layers.

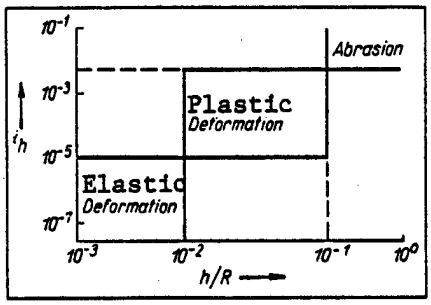

Fig. 6. Specific wear i_h and corresponding values for the ratio h/R in the case of the most important basic wear mechanisms according to [10].

It is assumed that the elastic-plastic deformations lead to the formation and to the growth of submicroscopic tears in the layer close to the surface. Such tears, as "flaws" ("Griffith pockets") exceeding the strength of the material, are considered to be responsible for the extreme discrepancy between the theoretical and the real strength of glass. Since friction processes are always accompanied by chemical reactions it is considered that chemical reactions between the workpiece surface, the suspension agent, the polishing agent vehicle and the polishing agent also play an important role in glass polishing, as has been described in [13, 15]. The entire phenomenal picture including submicroscopic porosity, rebinder effect (that is, the effect of boundary surface active media), notch-tear effects, microplasticity, etc., can, according to [16], be explained on the basis of a theory which views phenomena at the layer close to the surface as a thermodynamically caused modification of the glass interior in terms of an entropy gradient (Figure 7).

7. Summary

Starting from test results relating to the formation of the fine optical figure in polishing optical functional surfaces, viewed as a consequence of material separation processes and also starting from a comparison between the mechanisms of lapping and polishing theoretical conceptions have been developed which aim to explain the polishing process and which contain a proposed complex view of the elementary processes occurring during polishing.

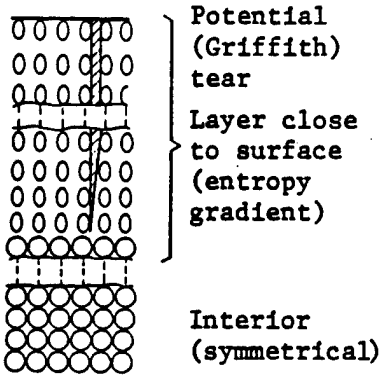

Fig. 7. Dynamic structure of a layer close to the surface according to [17].

By means of a comparison with knowledge acquired regarding elementary friction-wear mechanisms and by means of an estimation of tribological parameters it has been possible to show that the formation of the optical fine figure in polishing optical glass may be described in terms of a triboseparation. As a result of conditions characteristic of the workpiece and of the tool an external friction takes place in which material particles are removed as a result of multiple elastic-plastic deformations of the layer close to the surface which has in turn been subjected to physicochemical modifications.

Practically effective application of the theoretical models which have been set up within the context of fundamental research regarding the processing of optical media presupposes further investigations aimed at clarifying the complicated mechanisms of friction.

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CSO: 2302/109

RESOLUTION OF ACADEMY'S '85 GENERAL ASSEMBLY

Budapest MAGYAR TUDOMANY in Hungarian No 7-8, 1985 pp 581-586

[Text]

I

The Hungarian Academy of Sciences
--Notes with satisfaction that the MSZMP "Regards science as socialism's natural ally, respects the freedom of scientific research, and appreciates fruitful scientific work";

--Regards as its duty to contribute actively and with initiative toward the realization of the objectives set by the 13th MSZMP Congress, and to utilize for this purpose the possibilities and means provided by law and its own statutes.

1. The Academy includes among its most important tasks for the next five-year period the initiation and support of basic research that will help solve tasks of fundamental importance for the development of the national economy and of science, and which will seek and provide answers to the pressing problems of our changing world, our age and society. The Academy regards the following as especially important:

--Analysis of the social conditions in Hungary, better clarification of the concept of justice, and the definition of its possibilities and limits, amidst the conditions of the given period;

--Research that serves the economy's intensive development, including the investigation of management's new conditions and tasks, and of the uncovering and utilization of resources, with special attention to the development of Hungarian society, the world economy, and international cooperation, particularly among socialist countries, and to the directions of technological progress;

--Research that provides the foundation for the development of socialist national culture, historical awareness, humanistic public thinking, and education;

--Research to improve the conditions of meaningful and healthy human life, and to maintain the quality of the natural environment.

2. With due consideration for present-day needs, the Academy intends to support increasingly research that provides the foundations for the realization

of long-range objectives; furthermore, the internationally already recognized, traditional research directions; and research that serves to lay the foundations for and to introduce new, modern sciences.

3. The Academy informs the party and government agencies about the proven results of its scientific research, prepares proposals for them, and initiates and monitors the realization of such proposals. But it expects to be consulted in due time before the adoption of government decisions requiring scientific substantiation, and to be informed of the decisions.

4. Bearing these objectives in mind, the Academy sets the basic policies of its entire activity and its timely tasks, mobilizes its bodies, institutions and administrative agencies for the realization of these tasks, and invites the effective cooperation of every participant in scientific public life.

II

1. The Academy will assume also in the future a marked role in the solution of socioeconomic problems. To this end the Academy:

--Continues to regard as valid the decision of its 1980 general assembly that "multidisciplinary forums must be more bold in placing on their agendas the timely questions that (1) are of great importance to science, society, the national economy, communal life or public life, (2) do not require a decision within a short fixed time limit, (3) have not been reconciled as yet by the higher state agencies, (4) are therefore in a more pliable state, (5) but the postponement of their analysis could cause irreparable harm. Specifically for the purpose of preparing the right decisions, it is desirable to submit these questions in this form to unrestricted debate, accepting even the risk of posible mistakes." On the basis of the experience gained during the past period, however, it seems expedient to include fewer topics in the new program that the Presidium will prepare. Suitable time limits must be set for elaborating and debating these topics. And the requirement must be applied to them that they have to produce for the social and state agencies proposals and information that are more specific and more readily applicable in practice.

--Must participate in social and national economic long- and medium-range planning also in the coming period, by preparing analyses, studies, forecasts and concepts, or by reviewing and commenting on such drafts prepared by other central agencies.

2. The general assembly deems necessary the realization of a selective research policy that fits the rapidly changing conditions, enhances performance and efficiency, and is performance-oriented. To this end, the system of managing, planning, financing and evaluating scientific research and development must be perfected, and objective conditions must be ensured.

--The general assembly recommends that the agencies which manage research improve--in agreement with the science-policy tasks--their cooperation in planning joint research, and particularly in setting research priorities. It is especially important to assert the interests of society as a whole, and

coordinate Academy-sponsored research, university research, and research that serves directly the needs of production. The independence of the research centers must be increased gradually, and their decision-making authority broadened. If conditions permit, experiments with perfecting the management structures of the institutes should be made possible.

--In the course of perfecting national economic planning, the Academy is striving to gain acceptance of the fact that research and technological development are an integral part of economic development, its accelerating factor. It is desirable to increase the participation, responsibility and national role of the Academy of Sciences in the planning and regulation of research and development, especially in managing and evaluating basic research, and in providing the material conditions for it. The MTA continues to regard as its task the ever greater financial support of individual university research projects. The central allocations must be obtained that are necessary for this purpose.

--The national system of financing research must be radically perfected, so that it will enhance the efficient utilization of resources, respond more sensitively to achievements, and avoid unnecessary rigid restrictions. We must achieve that the manager of a research topic is able to spend without any restrictions the forint grant for the given topic.

--The gap between modern research conditions and the conditions in Hungary is widening even faster than the international technological gap. This trend must be reversed, because the research phase precedes the technologies. Reconstruction of the infrastructure of domestic research, including the Academy's infrastructure, must be the first task. A concept of perfecting the infrastructure of research must be elaborated, one that includes mainly: increased provisions for basic research and university research; modernization of the stock of machinery and instruments; availability of the necessary computer capacity; more efficient organization of the procurement of machinery, instruments and parts; and modernization of the supply of research information. Care must be taken to avoid steps which, under the pretext of economization, could block or undesirably curtail our relations with countries that have the most advanced technologies.

3. To support economic development and to increase competitiveness, the general assembly deems it necessary that the growth rate of expenditures for research and development exceed the growth rate of national income. The general assembly calls attention to the fact that the declining proportion of outlays for basic research in recent years is jeopardizing our long-range development. Therefore a sharp rise is especially necessary in the proportion of outlays for basic research.

The general assembly also calls attention to the fact that statistics report larger outlays for scientific research and development than the outlays actually made or available for this purpose. It instructs the Presidium to inform the competent authorities about this and request them to adopt the necessary measures.

4. The general assembly views with concern the gradually deteriorating and now very serious situation of the publishing of scientific books and periodicals,

due predominantly to the obsolete printing base and distribution network, and to the unfavorable development of prices. The conditions under which the Akademia Publishing House and Press is operating are especially depressing. Therefore the general assembly deems it necessary that the Academy propose to the Science Policy Commission a review of the state of the publishing of scientific books and periodicals (which is an important part of the infrastructure of research) and the adoption of national measures to improve the situation, including the securing of the necessary amount of state aid. The general assembly is convinced that it would be wrong to rigidly enforce the principle of profitability in the system of economic regulation that applies to the publishing of scientific books and periodicals.

The Academy must use also the press and other mass media to enable society to gain suitable information about the research projects, their progress, possibilities and results, and to dispel the misconceptions that may arise regarding them.

5. The general assembly finds warranted a review of the resources available for the development of international scientific relations, including the possibility of increasing these resources, with special attention to enabling as many--especially young--researchers as possible to participate in direct cooperation. It deems necessary the expansion of cooperation in all those areas where the development of science makes cooperation indispensable. And simultaneously it proposes further simplification of the procedures pertaining to the formation of international scientific relations.

6. The general assembly states and recommends repeatedly that systematic conditions must be established enabling those who have undertaken long-term work abroad to maintain continuous contact with domestic scientific life, to gain also at home suitable recognition of their scientific results, and to advance commensurately with their scientific achievements upon their return home. The MTA administration should propose that the general 20-percent remittance obligation of those who undertake work abroad be applied in a differentiated manner to researchers, and be regulated so that the Academy will get a specified proportion of the inflow of foreign exchange.

7. The Academy must intensify its efforts to improve scientific replacements and the personnel conditions in science.

--The nomination of members, and the preparation of their election, must be a long-term process, with special attention to raising their quality and improving their age structure. The procedures for nominating members must follow approved guidelines.

--The Academy must take further initiatives to participate in university instruction, and to encourage the participation of university instructors in research at Academy institutes. Let it devote attention to the early identification and training of young talents, and to the improvement of postgraduate training.

--The Academy must see to it that the living conditions of the valuable permanent staff of researchers do not deteriorate in either an absolute or relative

sense. The general assembly requests the Presidium to prepare a proposal for increasing the allowances for scholars, including the stipends of Academicians.

--Efforts must be made to attract more qualified young researchers to scientific public life.

--The departments of the Academy must monitor with suitable regularity the scientific work of their still active members.

--Let the Academy initiate improvement of the deserved living conditions of those of its elderly members who are no longer able to supplement their pensions with suitable additional income.

8. The quality and effectiveness of the work performed by the Academy's bodies must be improved further. To this end:

--The scientific bodies must monitor fulfillment of the research plans, and the international and domestic development of the branches of sciences. They must also help to set priorities.

--The scientific bodies must review, at regular intervals, fulfillment of the long-range directions of scientific research and of the medium-range research plans. With their critiques and recommendations, they must aid the realization of these directions and plans, and request information on their utilization. And they must develop ways for organized cooperation and an expedient division of tasks among the scientific committees, program bureaus and program committees.

--On the basis of national information, the scientific bodies must continue the elaboration and review of interdisciplinary and special-purpose situation analyses of the branches of science. With their forecasts and recommendations, they must aid the science-managing agencies in making their decisions and setting the priorities based on a selective research policy.

--The scientific departments must improve the quality of their activity in personnel matters (research institute directors, university professors, doctors of science, etc.), adopt their standpoints on the basis of detailed information and adequate preparation, and present sound reasons for their standpoints. They must be ensured the time and conditions necessary for this purpose.

--The general assembly considers it desirable to restore, in modern form, the old Academy sessions at which papers are presented.

9. The general assembly authorizes the Presidium to review the MTA Statutes and Rules of Procedure, and requests it to report back the results of this review to the 1986 general assembly, with a proposal for amending them if necessary. The review should cover particularly the following:

--In view of the special importance of basic research, whether it is necessary to redefine the tasks of the MTA;

--Whether the expansion of the authority of the scientific departments and committees would be warranted;

--Whether it is feasible to establish foreign--not honorific--membership as a new form of membership; what wuold be the requirements for foreign membership; and what would be the rights and obligations of foreign members;

--After what voting procedure and with what distribution of the votes may a motion be regarded as adopted;

--Within what scope are multiple nominations warranted, and who should have this right.

In general, the review should aim for the expansion of democratic rights and safeguards.

10. The general assembly finds desirable the investigation of the question whether the establishment of three posts of deputy secretary general, respectively the filling of all three posts, will again be warranted in the future. If necessary, it recommends that the secretary general submit an appropriate proposal to the competent organs.

11. The general assembly requests the Presidium to continuously monitor the implementation of this resolution, and to prepare in the second half of 1987 a summary review of its implementation.

III

1. In relation to the research centers under its supervision, the Academy regards the following as its important tasks:

--During the coming period, the conduct of basic research that arises primarily from the internal development of the sciences, is of outstanding importance, and lays the foundation for the domestic long-range objectives; furthermore, participation in the solution of R&D tasks that serve the realization of the 7th Five-Year Plan's immediate socioeconomic objectives. Increased financial provisions must be made for basic research at the Academy's research institutes and the Academy-sponsored research centers also under the 7th Five-Year Plan, and suitable conditions for this must be ensured. The possibilities stemming from international scientific relations must likewise be utilized with due consideration for the preferential areas of research (or research tasks).

--More significant organizational changes in the MTA's network of research institutes are not warranted during the next plan's period. Within the existing network of institutions, the quality and age composition of the staffs must be improved, also by exercising more forcefully the functions of further training for cadres, and especially its supply of materials and equipment must be improved. The introduction of new organizational forms will be expedient only if they truly help to increase the efficiency of research. However, (1) the reinforcement of the existing research centers, (2) the establishment of various new forms of businesses, associations, and joint stocks of equipment on the basis of the existing institutions, and (3) the intensification of mutual scientific relations between the research institutes and the universities remain warranted. The available resources of the central research funds must be spent selectively and efficiently, to support primarily the research centers that are able to present outstanding achievements.

--The MTA secretary general must see to it that a summary report is prepared evaluating the present five-year period's--through 1985--research activity, its more important research results and their practical application.

IV

1. In agreement with the Presidium's proposal, the General Assembly elects by ballot

a. As Academicians, the following corresponding members:
Samu Imre (Dept I), Ferenc Papp (Dept I), Pal Pandi-Kardos (Dept I), Ferenc Tokei (Dept I), Jozsef Ujfalussy (Dept I), Klara Garas (Dept II), Istvan Hermann (Dept II), Domokos Kosary (Dept II), Gyorgy Szekely (Dept II), Denes Berenyi (Dept III), Gyula Csikai (Dept III), Imre Katai (Dept III), Dezso Kiss (Dept III), Laszlo Lovasz (Dept III), Andras Prekopa (Dept III), Istvan Lang (Dept IV), Janos Magyar (Dept IV), Ferenc Antoni (Dept V), Bela Halasz (Dept V), Istvan Nasz (Dept V), Tibor Czibere (Dept VI), Jozsef Lukacs (Dept VI), Gyula Hardy (Dept VII), Ferenc Nagy (Dept VII), Geza Denes (Dept VIII), Tibor Jermy (Dept VIII), Mrs Falus nee Katalin Szikra (Dept IX), Mihaly Simai (Dept IX), Laszlo Kapolyi (Dept X), and Mrs Kliburszky nee Maria Vogl (Dept X).

b. As corresponding members:
Eva Ancsel (Dept II), Gyula Juhasz (Dept II), Lajos Kardos (Dept II), Laszlo Makkai (Dept II), Ferenc Pataki (Dept II), Zoltan Daroczi (Dept III), Norbert Kroo (Dept III), Vera T. Sos (Dept III), Alfred Zawadowski (Dept III), Zoltan Barabas (Dept IV), Peter Horn (Dept IV), Zoltan Klement (Dept IV), Sandor Eckhardt (Dept V), Istvan Simonovits (Dept V), Szilveszter E. Vizi (Dept V), Arpad Csurgay (Dept VI), Jozsef Finta (Dept VI), Laszlo Forgo (Dept VI), Laszlo Keviczky (Dept VI), Gyorgy Szekely (Dept VIII), Gabor Vida (Dept VIII), Geza Herczeg (Dept IX), Robert Hoch (Dept IX), Peter Biro (Dept X), Erno Meszaros (Dept X), and Sandor Bokonyi (interdisciplinary).

2. The general assembly approves:
--The joint five-year report of the Presidium and acting secretary general;
--The five-year reports, respectively the summary informative reports for last year, submitted in writing on the work of the scientific bodies and the Central Office's organization;
--The oral presentations and the opening speeches to the debate, by the Academy's president and acting secretary general, and their answers to the questions raised in conjunction with the reports and informative reports.

3. The general assembly has debated the proposal of the nominating committee commissioned to prepare the election of officials, and has elected by ballot the following:

As the Academy's president: Academician Ivan T. Berend;

As the Academy's vice presidents: Academician Ferenc Marta, Academician Bruno F. Straub, and Academician Jozsef Ujfalussy;

As members of the Academy's Presidium: Academician Janos Szentagothai (Dept VIII), Academician Jozsef Bognar (Dept IX), Academician Mihaly Beck

(Dept VII), Academician Jozsef Fulop (Dept IX), Academician Tibor Klaniczay (Dept I), Academician Denes Berenyi (Dept III), Academician Pal Stefanovits (Dept IV), corresponding member Emil Pasztor (Dept V), Academician Gyorgy Vajda (Dept VI), Academician Tibor Vamos (Dept VI), and Academician Zsigmond Pal Pach (Dept II).

The general assembly submits to the Presidential Council the name of Academician Ivan T. Berend for confirmation as president of the MTA.

The general assembly proposes to the Council of Ministers the appointment of Academician Istvan Lang as the Academy's secretary general; and the appointment of Academician Kalman Kulcsar and corresponding member Arpad Csurgay as deputy secretaries general.

The general assembly authorises the chairman of the closed session to present to the Presidential Council, respectively to the Council of Ministers, the proposals necessary for implementation.

The general assembly expresses its appreciation and gratitude to the Academy's outgoing president, vice presidents, acting secretary general and his deputies, and also to all outgoing members of the Academy's Presidium, for their dedicated and fruitful work.

4. To ensure continuity of the scientific bodies' work, new elections of the scientific departments' heads, of their members with a voice but no vote, and of the heads of the committees attached to the Presidium and the scientific departments must be completed by 30 June 1985; and new elections of the entire network of committees must be completed by 30 September.

The guidelines for these elections are as follows:

--To spread the interdisciplinary approach, avoid duplications and establish closer cooperation with the ministries, there must be a shift among the various types of committees, in favor of comprehensive interdepartmental (interdisciplinary) committees and joint Academy-ministry committees.

--The increase, from one administration to the next, in the number of permanent committees, subcommittees and working committees must cease. Indeed, their number should decline, without prejudice to the performance of their tasks, and the scientific bodies should rely more on ad hoc committees.

--To maintain the authority and effectiveness of committee work, the size of the individual committees should not exceed 20 members, but from time to time the committees should include in their work also outside experts.

--To aid the further unfolding of scientific life outside the capital, the above restrictions will not apply, at least not under the next administration, to the number and size of the regional committees, and their special and working committees.

--The proportions of young researchers and women in the committees must be increased sharply, from among the experts who produce scientific results.

--On the individual committees, the proportion of members who have postgraduate degrees should remain around 80 to 85 percent.

--On the basis of past experience, the practice of rotating one-third of the committees' members has proven suitable and, therefore, it may continue to be employed. In the course of rotation, care must be taken to prevent monopolies, the accumulation of offices and committee seats, and to drop the passive committee members. When electing new committee members, moreover, it must also be borne in mind that the Academy, in the light of its national tasks, is an "open" institution, and that this must be reflected also in the committees' composition by workplaces.

5. The general assembly authorises the Presidium to edit the final text of this resolution. Simultaneously, it requests the Presidium to examine the proposals presented at the general assembly but not covered by this resolution, and to adopt the necessary measures if warranted. Furthermore, to inform--if necessary, and in due time--the sponsors of all the proposals presented at the general assembly, about the Academy's standpoint and the adopted measures.

1014
CSO: 2502/3

JURISDICTION OF ACADEMY OFFICIALS DESIGNATED

Budapest MAGYAR TUDOMANY in Hungarian No 7-8, 1985 p 517

[Announcement: "Spheres of Authority of the Secretary General, Deputy Secretaries General of the Hungarian Academy of Sciences, and of the Director of the Academy's Central Office"]

[Text] As of 1 June 1985, supervisory authority is divided among the secretary general of the MTA [Hungarian Academy of Sciences], the deputy secretaries general, and the director of the academy's Central Office as follows:

Secretary General ISTVAN LANG
Exercises general supervision over
--The Personnel Department,
--The Research Organization Department,
--Among the areas of research belonging to the Natural Sciences Department, from a scientific viewpoint, over medical, biological and agricultural research, and individual research programs (for pharmaceuticals, plant protectants, bioengineering, and environmental protection); furthermore, over
--The Secretariat of the Intercosmos Council.

Also oversees
--The performance of tasks related to the work of the Dubna Committee; and
--The Hungarian section's activity within the Committee for Coordinating the Development of Scientific Instruments and the Automation of Research.

Deputy Secretary General KALMAN KULCSAR
Exercises general supervision over
--The Social Sciences Department;
--The International Relations Department; and
--The Press Secretariat.

Also oversees
--The Akademia Publishing House Council.

Oversees under delegated authority:
--The MTA Library;
--The Akademia Publishing House and Press, as manager;

--The Committee for Coordinating International Relations in the Social Sciences; and
--The Committee for Coordinating Nongovernmental International Scientific Organizations.

Represents the MTA on
--The National Scholarship Council;
--The Committee for Coordinating the Socials Sciences; and
--The National Education Committee.

Deputy Secretary General ARPAD CSURGAY
Exercises general supervision over
--The Natural Sciences Department.

Heads
--The Computer Technology Applications Committee; and
--The Hungarian section of the Council for the Coordination of Computer Technology and Information Science.

Chairs
--The Academy Youth Committee.

Represents the MTA on
--The CEMA Standing Government Committee on Scientific and Technical Cooperation; and
--The Science Policy Commission's Committee for the Coordination of International Developmental Relations.

Represents the MTA Central Office on
--The Scientific Qualifications Commission.

MTA Central Office Director SANDOR KONYA
Over and above the Central Office's internal supervision, exercises general supervision over
--The Finance Department; and
--The Administration and Legal Department.

1014
CSO: 2502/3

COMPUTER SITUATION IN COOPERATIVES COMMENTED

AU280950 Budapest NEPSZAVA in Hungarian 24 Oct 85 p 7

[Article by Janos Cseh: "Delusion Technology"]

[Text] Delusion technology. Many people give this name to one of today's most exciting technological novelties. Turning the term computer science into delusion technology [szamitastechnika--amitastechnika] represents disillusionment. How can we explain this? Is it possible that domestic acceptance of the most modern technology could be so diverse?

This much is already certain: That the appearance and application of the first domestic computers was preceded by increased expectations. This overexcitement led to disappointment in many places after the initial failures. It became clear that the utilization of computer science can bring results only in places where one can ensure the collection of data and information, the organization and perfect programming of these, and an evaluation at an adequate level of the results received.

The machine does not substitute for the planning, evaluating, and managing expert; it only assists him.

This is especially true regarding the producer cooperatives. There is almost an anarchy behind their great variety, and this gives the impression that there is a lack of coordination between the means applied and the organizational forms. The variety of types of computers presently in use will soon reach one hundred. The number of organizations dealing with the preparation of computer programs is not much smaller than this.

It is, perhaps, not by accident that the presidium of the National Council of Producer Cooperatives also put on its agenda the examination of this issue, and several critical remarks were also made. According to them, the programmers' agricultural accounting knowledge "is not general" and they have agricultural knowledge only in exceptional cases. This leads to the extremely thought provoking fact that the degree of utilization of computers purchased by producer cooperatives is generally only a fraction of the possible utilization.

This conclusion is striking, and the shortcomings are far from ending. Much resentment is also caused by the fact that the technological conditions for

operating the machines in the cooperatives are not settled, and that the programs prepared can be used only for a fraction of the administration obligations stipulated by the state.

Every cooperative was exposed to a real invasion in past years: Various firms indiscriminately offered them the best, the most intelligent and most efficient machines. It was hardly possible to resist the tempting offers. Even a lack of funds did not keep many from spending their forints on this instead of on urgently needed tractors, as they did not want to fall behind the others at least in this respect.

A great number of domestic and foreign types developed one after the other, and the increasing supply of programs soon made the authorities in agricultural enterprises uncertain, and an increasing number of them felt the need for something to hold on to, some central assistance. What should be the direction of their development? How much should they allocate for this activity? These were the most frequently voiced questions.

It is, perhaps, needless to say that the spreading of computerized activity is carried out by profit-oriented enterprises and economic organizations, and that they were cashing in an increasing sum for their services. Many heads of cooperatives realized with bitterness that, while one or another firm dealing with computer programs is increasing its price incomes and profits at a fascinating rate year by year, the system adapted for them does not work or can be repaired at the expense of tremendous extra work and cost....

From the above we can already draw the conclusion that computer activity in the agricultural cooperatives is not harmonized enough and the methods that would genuinely help the cooperatives in applying the cheapest and most suitable computer science procedures almost did not develop.

What can be done? First of all the district organs which represent interests, the TESZOV, should coordinate this activity of the agricultural cooperatives, and thus accelerate the development. The experiment conducted in Szekesfehervar over several years is already providing a lot of experience for the other counties also and sooner or later it will be worth examining the possibility of others joining it. It is also important for closer relations than at present to develop between the agricultural management organization and computerization joint enterprise and the country's organ which represent interests. Greater harmony can facilitate a more efficient reimbursement of the funds allocated for development and can eliminate the disappointment experienced in connection with computerization in some places. Because this achievement of our age is destined for more than delusion.

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CSO: 2502/13

BRIEFS

CNC MACHINING CENTER PRODUCTION--This year the Machine Tool Factory of the Csepel Works is assembling 18 CNC Yasda high-precision machining centers. In addition 20 "dwarf" versions of such centers developed last year will be manufactured. The centers are being exported to the CEMA countries, the FRG, France, Austria and India. Some will also be available to domestic consumers. [Text] [Budapest NEPSZABADSAG in Hugnarian 15 Nov 85 p 5] /6662

CSO: 2502/15

ACTIVITY OF ELECTRONIC COMPUTER ENTERPRISE

Bucharest STIINTA SI TEHNICA in Romanian No 8, Aug 85 p 36

[Unsigned article: "Electronic Computer Enterprise"]

[Text] The Electronic Computer Enterprise, which was established in 1970, has accomplished remarkable increase in production, and indirectly in labor productivity, over the intervening period. It is a well-known firm today, both in Romania and abroad. Operating under a license for the Felix C-256 medium-capacity computer, the Electronic Computer Enterprise (ICE) has developed, on the basis of original research and cooperation with various special institutes (Research Institute for Computer Technology, Central Institute for Data Processing), an entire series of equipment covering virtually the entire range of applications on the world market (computer aided design, control of industrial processes, general data processing, computer networking, financial and bank management, etc).

Today customers have a choice of medium and high-capacity general-purpose computers (Felix C-512/C-1024, Felix 8010/8020), high-performance minicomputers compatible with similar equipment made by foreign firms (I-102F/106, Coral-4001/4011/4021/4030), microcomputers characterized by a high degree of integration and widely available to ordinary users (M-18B/M-118/M-216/CUB), invoicing and accounting machines with direct economic applications (FC-1000), and various terminals and communications devices (VDT 40C, VDT 132, and VDT 125 displays and 2500/2505 modems).

In view of the trends on the world market, the minicomputers made by ICE (in the Independent and Coral series) have been designed at a very high technological level, with a number of characteristics making them competitive on the world market: internal 16-bit structure, processing at word level (16 bits) or byte level (8 bits), internal memory ranging from 256 kilobytes to 4 megabytes, high-performance floating-point processors, asynchronous 8-line multiplexers with modem interfaces, communications processors, interfaces for connection to industrial processes, and peripherals (floppy disk drives, diskettes of medium to high capacity, magnetic tape, parallel and high-speed serial printers, etc).

From the very beginning of the explosion on the world microprocessor market, ICE has been engaged in an effort to design high-performance microcomputers perfectly suited to data processing needs in fields of

great topical interest (office computing, financial and banking records management, graphic display, computer-aided design, and engineering calculations). In addition, connection of these microcomputers as intelligent terminals to other high-power computers (minicomputers or mainframe computers) creates the possibility of developing complex computer networks in which a great part of the tasks previously assigned to central computers is taken over by a microcomputer network. Users are thoroughly familiar today with the features enabling the M-18B, M-118, M-216, and CUB microsystems to perform a wide range of applications: central processing unit with 8080 or 8086 microprocessor (M-216), internal memory of 256 kilobytes or 1 megabyte (M-216), synchronous/asynchronous multiple interfaces, alphanumeric or graphic display terminals, and peripherals (floppy disk drives, tape readers/ punches, magnetic tape, high-speed serial printers, etc).

In addition, the CUB personal computer offers the possibility of convenient and efficient use based on facilities created by the operating system and software packages.

Current ICE efforts are aimed at development of "turnkey" systems, such as ones designed for control of industrial processes (aluminum electrolysis, metallurgy, control of chemical industry installations, etc). To provide for connection of computers to various industrial processes, ICE has designed and begun the production of special equipment such as the SPOT 83 microcomputer, which can operate either independently or in conjunction with another system. With its typical microcomputer structure, it allows connection to various processes by means of analog input/output interfaces (16/24 channels) or digial input/output interfaces (48 channels). By means of them the SPOT 83 process equipment directly controls mechanical or electromechanical contacts, receives information from sensors installed in a process, controls motors of various types, etc. Its modular structure permits adaptation to specific user needs by simple addition of software packages.

The experience gained by ICE has been embodied in large numbers of export shipments to countries such as Austria, Czechoslovakia, the People's Republic of China, the Federal Republic of Germany, Iraq, Belgium, the German Democratic Republic, India, etc.

6115
CSO: 2702/1

ICPE-IAEAME COOPERATION IN ELECTRICAL MACHINE PRODUCTION

Bucharest ELECTROTEHNICA in Romanian No 7-8 Sep-Oct 85 pp 350-351

[Article by Constantin Apetrei et al.: "Results of Cooperation between ICPE (Research and Design Institute for the Electrical Engineering Industry), Bucharest, and IAEAME (Enterprise for Electrical Equipment and Machines), Sfintu Gheorghe to Promote Innovation and Technical Progress in Electrical Machine Manufacture"]

[Text] The manufacture of electrical machines is now in a new stage of development in Romania, determined chiefly by the need to turn out products of world-level performance, ones characterized by a high degree of use of raw materials and semi-manufactures, both through development of special electrical machines and by upgrading such machines by adding appropriate electronic command systems. An important part is also played by the need for developing new types of electric machines and beginning their production in order to eliminate imports.

The development of electric machines is a traditional activity at ICPE-Bucharest. It began with research, development, design, and startup of the manufacture of general-purpose electrical machines at appropriate enterprises, and now the institute is involved in research, development, and design of a wide variety of types of electrical machines, both general-purpose and special-purpose equipment, including the appropriate control systems.

Depending on the degree of technical and technological complexity, some of the electrical machines developed and designed at ICPE have been designed for small-batch production by the institute itself. Production has then been gradually transferred to specialized factories. Some machines, on the other hand, have been developed and designed in direct cooperation with electrical machine enterprises.

The direct cooperation between the research sector and specialized enterprises, between ICPE and IAEAME-Sf. Gheorghe, has yielded good results, the fruit of the combined efforts of the institute and the enterprise.

It should be noted that ICPE, in selecting this enterprise as future manufacturer, and, of course, collaborator, in the product design stage, as in the case of cooperation with other specialized enterprises, pursued the aim of ensuring a suitable degree of integration of new products, use of standardized elements, and use of recyclable materials.

Thus, in 1980, following the insistent demands of builders of hoisting and plant handling equipment, which were justified by the need for modernizing these machines and increasing the competitiveness of these machines, electrical machine manufacturers were assigned the urgent task of starting up the production of a new series of asynchronous brake motors, with a tapering rotor and included cone brake. This structural solution, which from the functional viewpoint permits production of complex microspeed equipment, would have involved new investments amounting to tens of millions of lei, possibly including outlays for the acquisition of a license. An ICPE research team took up this problem and succeeded in a very short time in working out an original structural solution whose operation has been tested with an experimental model.

The results of the experiments have confirmed that, from the viewpoint both of operation and of performance, the ICPE solution can successfully replace the cone rotor design, with the added technological advantage of conventional design with cylindrical rotor. Considering the power range demanded by customers, the most suitable enterprise for manufacturing these products was IAEAME in Sfintu Gheorghe. Under a research contract signed between the institute and this enterprise, permanent cooperation between ICPE researchers and both design personnel, builders as well as technologists, and the prototype production section at the enterprise has resulted in improvement in the solution worked out by ICPE and in development of a series of MAF asynchronous brake motors created through diversification of the MA series of general-purpose asynchronous motors made by IAEAME-Sf. Gheorghe.

The MAF asynchronous brake motors are going to meet the demands both of domestic manufacturers of hoisting and plant handling equipment and manufacturers of machine tools, machinery in light industry, etc. Their production in Romania will lead to elimination of imports of cone rotor brake motors (from DEMAG in the Federal Republic of Germany).

At the same time, the MAF motors will virtually replace the ASFM attached-brake motors, since their technical and economic performance is clearly superior. The MAF brake motors are in the category of self-limiting motors, in which the force required for operating the brake is generated by the magnetic field of the motor itself. The original structural solution, which has been patented both in Romania and abroad, and the high performance recommend them for export as well.

On the occasion of development of the MAF motors, of sizes 63-132, the MA base series was also extended by addition of motors of sizes 63 and 71. The latter also offer competitive performance features.

Another important sector of cooperation between ICPE and IAEAME-Sf. Gheorghe has been represented by equipment for the garment industry. Modernization of this equipment, as in fact of all technological equipment, has been and continues to be an objective for achievement of increasingly high productivity in the manufacturing process. It has been necessary for the ICPE specialists to develop the drive system of the SAMCI industrial sewing and/or overcasting machines, in an original patented design replacing the drive motor with mechanical friction coupling. As in the case of the MAF

series motors, the system has been improved in cooperation with specialists of the enterprise and production has begun.

When production of the new drive system was instituted, an effort was made to achieve better utilization of the products already being made at IAEAME. What is specifically involved is special use of the MA 19 F 100-2A induction motor with squirrel-cage rotor. Within the drive unit, the electric motor is associated with a system of electromagnetic friction clutches which, together with a self-ventilated inertial flywheel, makes up a variable-speed drive system supplied by an electronic control unit forming an integral part of the system. The SAMCI drive system provides for continuous variable-speed sewing, with the needle halted at the end of a seam in a predetermined fixed position (up or down), raising the clamp, and driving the thread cutting and slackening devices.

The technical characteristics of the product, which include dynamic coupling and braking conditions, the speed control range, and positioning accuracy, are comparable to those of similar products made in the Federal Republic of Germany, the United States, etc.

Turning out a product of suitable quality involves achievement of high accuracy as regards parallel, concentric, and perpendicular positioning of the surfaces of mechanical parts. This has necessitated steady cooperation between the designer (ICPE) and the manufacturer (IAEAME), both during the production start-up, technical assistance, and customer service period and at the present time, for the purpose of ongoing modernization of the product and making it more reliable.

Similarly, as in the cases mentioned, IAEAME has started up production of the TA-1 synchronous tachometer generator, a product of advanced technology. It is designed for measurement of the speed of thermal engines (for ships, motor vehicles, and subway cars) and for special applications.

To improve product quality, ICPE has developed test stands for IAEAME-Sf. Gheorghe for the testing of 3-phase induction motors, stands for detection of localized defects in enamelled copper conductors, design of a sound camera, etc. At the same time, ICPE specialists have at all times provided the technical assistance needed for suitable solution of related problems connected with the manufacture of electrical machines at IAEAME-Sf. Gheorghe.

The cooperation between institute and enterprise will continue and will be improved in the future, for the sake of ongoing improvement of the technical level and the competitiveness of the plant's products.

To reduce consumption of energy and materials, along with ensuring world-level performance, it has now become necessary to redesign the general-purpose induction motors and produce them in a single uniform series.

Since work of considerable scope is involved (the entire range of general-purpose induction motors is affected), it will be carried out in direct cooperation with special enterprises, including IAEAME-Sf. Gheorghe.

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USE OF SOLAR POWER IN PHOTOVOLTAIC, THERMAL CONVERSIONS

Bucharest ELECTROTEHNICA in Romanian No 7-8 Sep-Oct 85 pp 316-320

[Article by Doina Moraru et al.: "Solar Energy Applications"]

[Text] The activities conducted at the ICPE (Research and Development Institute for the Electrical Engineering Industry) over the last 10 years in connection with conversion and use of solar energy has had the aim of increasing the efficiency of energy conversion by various means, both by creating indicative applications and making an energy contribution to the consumer of the application, and also developing industrial or micropilot production for solar energy conversion, which has reached a performance level making solar energy installations competitive with conventional energy sources.

The following discussion will be devoted to concise presentation of the main accomplishments of the research of ICPE and other institutions cooperating in the field of photovoltaic conversion of solar energy into electric energy and in the field of conversion of solar to thermal energy by use of concentrating solar collectors.

1. Photovoltaic Batteries

The method of direct conversion of solar to electric energy has been pursued since 1974, with the following main objectives:

a) Development of demonstration solar generators serving simultaneously as test stands for observation of the behavior of different conversion systems under natural conditions.

b) Manufacture of a small batch of solar batteries to supply current to isolated consumers.

c) Development of research in the area of photovoltaic cells and batteries to lower the cost of energy supplied, so that the cells may be used on a larger scale.

The first solar generators performing direct photovoltaic, thermoelectric, and thermionic conversion were produced by ICPE in cooperation with IFTM (Institute for the Physics and Technology of Materials) and ICCE

(Central Institute for Energy Research) in Baneasa, over the 1976-1980 period, the generated power range being 0-10 watts. The converter elements were produced in the laboratory, and the monocrystal silicon photovoltaic cells at ICCE-Baneasa. Thermoelectric elements based on bismuth telluride and lead telluride were produced at IFTM and ICPIAF at Cluj-Napoca, and the thermionic converter at IFTM.

In 1982, ICPE approved the first photovoltaic modules of monocrystalline silicon produced by IPRS (Enterprise for Radio Parts and Semiconductors) at Baneasa and the technology of small-batch manufacture on a pilot line at the institute.

The characteristics of these modules are given in Table 1.

Table 1. Characteristics of ICPE Photovoltaic Modules

Parameter	Unit of Measurement	SM6-36/75 module	SM12-36-50 module
Short-circuit current	A	0.750	0.425
Open-circuit voltage	V	21	21
Maximum power	W	10	6.5
Area	m^2	0.24	0.13
Weight	kg	3	2

Production of the modules made it possible to carry out the first photovoltaic battery applications to supply television receivers, radiotelephones, electric clocks, an electric fence to keep cattle from straying, water pumping systems, and lighting elements in data acquisition systems.

Experiments were also conducted on supplying part of the electric energy for greenhouses with photovoltaic batteries whose installed capacity amounts to around 1 kilowatt at a solar radiation intensity of 600 watts per square meter.

The need for lowering the cost of photoelectric cells to broaden the range of application to a significant scale in the energy budget of the country has led research to perfect the technology of producing photoelectric cells in thin polycrystalline or amorphous layers, and to develop cells operating under concentrated solar radiation conditions.

The first batteries with thin-layer cells, produced by IFTM over the 1980-1984 period, are cells based on Cds-Cu_2S evaporated or deposited by

pulverization in air on the basis of amorphous silicon. The first 1-watt battery with cells based on Cds-Cu_2S were approved in 1984.

Cells based on GaAs and AlGaAs and operated by concentrated solar radiation (concentration factor C = x 500), which were produced in the laboratory by IFTM, were used to produce the first experimental battery with Fresnel lenses made at IAUC.

Research was conducted simultaneously at ICCE-Baneasa to produce photoelectric cells from polycrystalline silicon, from monocrystalline silicon of the MIS type, and from monocrystalline silicon used for operation under concentrated solar radiation conditions. ICPE has also been studying liquid photoelectric cells with semiconductor electrodes.

The fact that the conversion efficiency is still low (up to 5-6 percent for thin-layer cells and up to 10% for concentrated radiation cells) has caused the decision regarding establishment of a pilot plant for one of the alternatives to be deferred beyond 1985, so that the cost of energy produced can be lowered to 1-2 lei per kilowatt-hour.

2. Solar Installations for Thermal Energy Production with Concentration Collectors

An analysis of industrial heat consumption in the 50-150 °C range has shown it to be advisable to conduct research on development of low and medium-concentration solar collectors. In 1981-1982, two types of solar concentration collectors were approved (CSCF-1, with a concentration factor of x5 and CSC-2, with a concentration factor of x 16). These are cylindrical-parabolic collectors oriented from east to west. The first collector type, which was initially made by the Autobuzul Enterprise in Bucharest, is currently manufactured in an improved version by the Electric Contactor Enterprise in Buzau, while the CSC-2 collector is in the zero series approval stage at the same enterprise.

Commencement of manufacture of the CSCF-1 collectors has permitted development and approval of installations for various industrial uses.

2.1. DS-1 Solar Distiller

This solar distiller, approved by ICPE in 1984 and designed for production of distilled water for use especially in motor vehicle fleets and in laboratories, and school laboratories in particular, has the following characteristics.

Type of collector used: CSCF-1-2.5

Total collector area: 10 m^2

Weight: collectors, 370 kilograms; distiller 45 kilograms.

Distilled water output: 0.5-2.3 kilograms per hour with solar radiation intensities of 400-800 watts per square meter.

Unit cost: 2.0 lei per kilogram of distilled water.

2.2. Solar Installation for Hot Water and Hot Air Production

The installation, designed by ICPE in cooperation with ISPE, was approved in 1983 and extended in 1984. It was tested at the IPNC-Sabarul (Sabarul Mixed Feeds Processing Enterprise), Ilfov Agricultural Sector.

The following are the chief characteristics of the installation.

Structural Features

1. CSCF-1 cylindrical-parabolic solar collectors (collection surface: 2 m^2, concentration factor: x 5).

2. Total collection surface: 3000 m^2.

3. Hot water storage capacity: 240 m^3 (2 tanks each holding 120 m^3).

4. Water-air heat exchanger, mounted at the fan intake opening of an ITUB-12.5 drier made up of 12 BIV-840 x 2400/II batteries.

Performance Features

A schematic drawing is given in Figure 11.

1. Water discharge in the collection field = 30 m^3/h (10 kg/m^2h).

2. Air output to drier = 31,000 m^3/h.

3. Water output in heat accumulator-drier cycle: 10-30 m^3/h

4. Thermal conditions (depend on the solar radiation intensity and ambient temperature):

   — temperature at which water is discharged from collector field: 50-80 °C;

   — air temperature at drier inlet: 40-70 °C.

5. Period of operation of installation on average days:

   — collector field: 6 hours per day;

   — heat accumulators: 10-12 hours per day;

   — total: 16-18 hours per day.

6. Average heat capacity deliverable to drier: 0.2-0.25 gigacalorie per hour.

7. Average heat capacity generated by collector field: 0.5 gigacalorie per hour.

8. Number of hours of useful insolation (according to IMH data):

Month:	Apr	May	Jun	Jul	Aug	Sep	Oct
Hours:	138	156	162	168	168	156	144

The calculated data resulting from running on a computer program permitting determination of the amount of heat produced by the collector field and the amount of heat accumulated (and accordingly, after determination of the difference, the heat capacity delivered to the drier), as a function of the climatic parameters, the collector characteristics, and the water discharge in the two cycles (field-accumulator and accumulator-drier) have been confirmed by measurements performed during the barley drying season (June-August) and corn drying season (September-October).

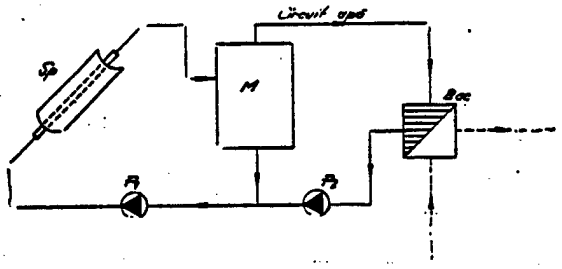

Figure 11. Schematic diagram of the IPNC installation: Sp, cylindrical-parabolic collector: M, storage installation; Bac, water-air heat storage battery; P1, P2, pumps; Circuit apa, water circuit.

Table 2 gives an excerpt from the calculated data listing for several operating modes of the installation near the rated level. A period of 6 hours of operation of the collector field and a period of 10 hours of drier supply from the accumulator following interruption of operation of the collector field were adopted in calculation. The underlined values represent customary operating conditions, and it is to be seen that the installation can produce 3-3.5 gigacalories per day on an average day. Consequently, approximately 0.19-0.22 gigacalories per hour can be delivered to the drier in the event of an operating period of 16 hours (2 shifts).

The collector field can thus produce 0.5-0.6 gigacalorie per hour on an average day in 6 hours of operation. Hence 550-660 gigacalories of heat are produced per year over the April-October period, or 400-480 gigacalories per hour in the case of feeds alone.

The cost of the energy supplied by the prototype installation is around 400 lei per gigacalorie. Since the cost of solar collectors has dropped,

the cost of the energy supplied by other similar installations to be produced will decrease to 200-250 lei per gigacalorie.

Table 2. Calculated Data for Certain Operating Conditions of the IPNC Sabaru solar installation for producing hot water and hot air

$\bar{a}_A$	t_0	t_f	Q_{ac}	Q_{st}	G_A
10.00	63.96	39.65	2 917 740.61	354 703.13	10 000
10.00	69.48	48.08	2 567 087.31	3 371 786.91	15 000
10.00	73.93	54.86	2 287 528.62	3 230 031.20	20 000
10.00	77.55	60.37	2 061 324.91	3 114 762.04	25 000
10.00	80.53	64.71	1 875 137.55	3 019 544.59	30 000
10.00	83.04	68.71	1 719 447.99	2 939 788.72	35 000
10.00	85.16	71.93	1 587 436.79	2 872 381.87	40 000
10.00	86.98	74.70	1 474 137.02	2 814 318.47	45 000
10.00	88.56	77.10	1 375 832.27	2 763 730.18	50 000
15.00	59.07	31.67	3 287 744.27	3 795 653.20	10 000
15.00	63.53	38.61	2 989 375.10	3 639 872.54	15 000
15.00	67.43	44.66	2 732 843.64	3 503 625.09	20 000
15.00	70.79	49.84	2 513 700.03	3 386 497.65	25 000
15.00	73.68	54.30	2 325 607.63	3 285 660.12	30 000
15.00	76.17	58.16	2 162 926.42	3 198 295.94	35 000
15.00	78.38	61.53	2 021 075.52	3 122 034.37	40 000
15.00	80.30	64.50	1 896 418.88	3 054 772.07	45 000
15.00	82.01	67.12	1 786 077.00	2 995 578.47	50 000

— Solar radiation intensity I = 600 kcal/m2h.

— Coefficient of heat loss at solar collector receptor Kr = 10 kcal/m^2h degree.

— Geometric efficiency: cos i = 0.8, where i is the angle of incidence of the solar radiation impinging on the collector.

— Solar radiation concentration factor: x 5.

— Characteristic of water-air heat exchanger KS = 20,000 kcal/h degree.

— GA is the water discharge through the water-air heat exchanger (kg/h).

— $\bar{a}A$ is the specific water discharge in the collector field (kg/m^2h).

— t_θ is the temperature in the heat accumulator at the time of interruption of collector field operation (^oC).

— tf is the temperature in the heat exchanger at the time of interruption of consumption (^oC).

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END